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EXAMINER

SMITH, JACKSON R

ART UNIT	PAPER NUMBER
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1709

MAIL DATE	DELIVERY MODE
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06/19/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/809,979

Applicant(s)

THOMPSON ET AL.

Examiner

Jack Smith

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-16 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a). Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 6/25/04 and 7/20/05.
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- ☐ Notice of Informal Patent Application
- ☐ Other: ____.

DETAILED ACTION

Specification

1. The disclosure is objected to because of the following informalities: typographical errors and inconsistencies. For example, paragraph [0019] refers to the "molecular weight" of a transition metal, M. This is incorrect terminology; the claims should refer to the atomic weight of the elemental metal. This follows from the fact that any transition metal must be an elemental metal by definition. Appropriate correction is required.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 4-11 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Each of these claims refers to the "molecular weight" of a transition metal, M. This is incorrect terminology; the claims should refer to the atomic weight of the elemental metal. This follows from the fact that any transition metal must be an elemental metal by definition. In order to interpret these claims on their merits, the phrase will be interpreted as specifying the atomic weight of the transition metal M.

The formula (IV) of claim 7 contains a variable "Z" that is not defined in the text of the claim. Since this notation is used in previous claims consistently to

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refer to the same site of the same ring in claim 5, the limitation of claim 5 that Z is "selected from carbon or nitrogen," will be assumed to apply also to claim 7.

The text of claim 6 refers to a "ring A" but the formula of the same claim has no such ring. In order to interpret the claim on its merits, it will be assumed that the upper most ring in the formula of claim 6 is ring A.

Appropriate corrections are required.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

5. Claims 1,2,4,5-12 are rejected under 35 U.S.C. 102(b) as being anticipated by Lamansky et al. (WO 02/15645).

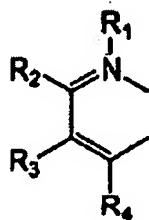
As to claim 1, Lamansky et al. disclose an organic photosensitive optoelectronic device (Organic light emitting devices (OLEDs): see page 7, lines 10-20) along with a series of organometallic compounds (see page 7, lines 10-11) that are meant to be used in these devices in order to improve their electrophosphorescence (column 4, lines 19-22). As is known to one of ordinary skill in the art, an OLED comprises: an anode, an active region; and a cathode.

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The invention of Lamansky et al. refers specifically to OLEDs in which the active layer is composed of the "phosphorescent organic compound" (page 7, lines 10-11) that is created when the ligands of Figures 5a-5d are combined with the ligands of Figures 6a-6c and a "heavy transition metal such as Ir" (page 13, line 20) as describe on pages 13 lines 19-23 and page 14 lines 1-5. As can be seen from Figures 5a-5d and 6a-6c, several of these materials (e.g., the one that results from combination of the leftmost ligand of the top row of Figure 5a or the right most ligand in the top row of Figure 5d with the ligands of Figure 6c and Ir, etc.) are cyclometalated organometallic compounds. Although the OLED as described in Lamansky et al. to as a "light emitting device" rather than one that specifically produces a photogenerated current when illuminated with light, the latter is an inherent property of the emissive layer formed as described on pages 13 lines 19-23 and page 14 lines 1-5.

As to claim 2, Lamansky et al. state on page 13, line 2 that their cyclometalated organic compound may contain a heavy transition metal such as Ir and list several other "preferred metals" for the invention including Pt on page 16, lines 1-5.

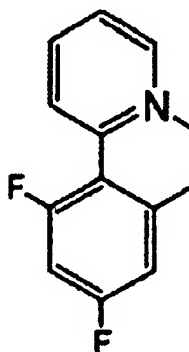
As to claim 4, the structure of this claim is obtained by combining the leftmost ligand of the top row of Figure 5a of Lamansky et al.:



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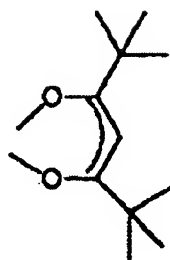
with any of the ligands in Figure 6c and using a transition metal such as Pt or Ir (page 16, lines 1-5), as instructed by Lamansky et al. on pages 13 lines 19-23 and page 14 lines 1-5. This corresponds to the following values of the parameters listed in Formula (I) of claim 4: M is a transition metal having atomic weight greater than 40 (i.e., Pt or Ir); Z is C (as shown above); the dotted line of Formula (I) is a double bond (as shown above); R^1 - R^4 are independently selected from hydrogen, alkyl or aryl (as instructed in the caption of Figure 5a of Lamansky et al.); (X and Y) are ancillary ligands from Figure 6c (e.g., the leftmost ligands of the top two rows); a is one; b is one; and the sum of a and b is two.

As to claims 5-9 and 11, several of the cyclometalated organometallic compounds of Lamansky et al. formed as described on pages 13 lines 19-23 and page 14 lines 1-5 have the structure recited in this claim. For example, the combination of the rightmost ligand in the top row of Figure 5d:

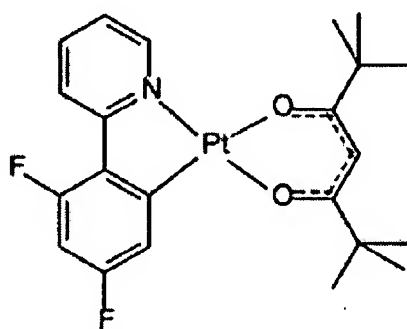


with the leftmost ligand of the second row from top in Figure 6c:

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and using a transition metal such as Pt (page 16, lines 1-5), as instructed by Lamansky et al. on pages 13 lines 19-23 and page 14 lines 1-5. This creates the structure of the compound (4',6'-F₂PPY)Pt(dpm):

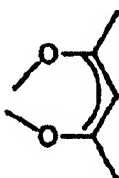


and corresponds to the following values of the parameters listed in the formula of claim 5: M is a transition metal having atomic weight greater than 40 (i.e., Pt); Z is C (as shown above); there are no R⁵ values (i.e., n = 0); there are two R⁶ values (i.e., m = 2, as shown above) and each is a halo group (i.e., fluorine); (X and Y) are the leftmost ancillary ligand from second to top two row of Figure 6c (as shown above); a is one; b is one; and the sum of a and b is two. It should be noted that this is one of many such example compounds created in the manner taught by Lamansky et al. that will read on claims 5-8. Note further, that the

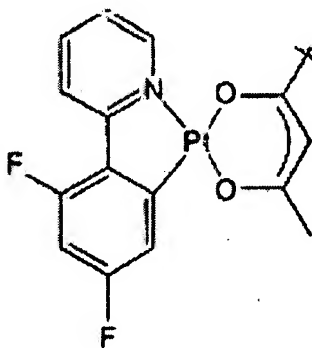
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structure, formed as instructed by Lamansky et al., above is identical to the structure in the figure of claim 11 in the instant application.

Another example of a cyclometalated organometallic compounds of Lamansky et al. that reads on claims 5-9 is found by the combination of the rightmost ligand in the top row of Figure 5d (above) with the leftmost ligand of the top row of in Figure 6c:



and using a transition metal such as Pt (page 16, lines 1-5), as instructed by Lamansky et al. on pages 13 lines 19-23 and page 14 lines 1-5. This creates the structure of the compound (4,6-F₂PPY)Pt(acac):



and corresponds to the following values of the parameters listed in the formula of claim 5: M is a transition metal having atomic weight greater than 40 (i.e., Pt); Z is C (as shown above); there are no R⁵ values (i.e., n = 0); there are two R⁶

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values (i.e., $m = 2$, as shown above) and each is a halo group (i.e., fluorine); (X and Y) are the leftmost ancillary ligand from the top row of Figure 6c (as shown above); a is one; b is one; and the sum of a and b is two. It should be noted that this is one of many such example compounds created in the manner taught by Lamansky et al. that will meet the structural limitations of claims 5-8. Note further, that the structure, formed as instructed by Lamansky et al., above is identical to the structure in the figure of claim 11 in the instant application.

As to claim 10, it is an inherent property of (4',6'-F₂ppy)Pt(dpm) (i.e., the cyclometallated organometallic compound from Lamansky et al. applied to claim 7 above) to form π -stacked chains. This is reflected in the specification of the instant application in Figure 6. See MPEP 2112 for a discussion of the inherency in regard to chemical structures and their properties.

As to claim 12, it is an inherent property of the cyclometallated organometallic material to absorb light in the near IR portion of the spectrum. For example, see Figure 5 of Lamansky et al. (US Patent 6,911,271) of (4,6-F₂PPY)Pt(acac) (the second compound discussed above in the context of claims 5-9).

6. Claims 1,2,4,5-12 are rejected under 35 U.S.C. 102(e) as being anticipated by Lamansky et al. (US Patent 6,939,624).

The applied reference has two common inventors with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any

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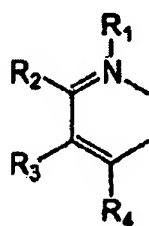
invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

As to claim 1, Lamansky et al. disclose an organic photosensitive optoelectronic device (Organic light emitting devices (OLEDs): see column 20, lines 22-45 which discuss the fabrication and testing of these devices) along with a series of organometallic compounds (Figures 5 and 6) that are meant to be used in these devices in order to improve their electrophosphorescence (column 4, lines 19-22). As is known to one of ordinary skill in the art, an OLED comprises: an anode, an active region; and a cathode. The invention of Lamansky et al. refers specifically to OLEDs in which the active layer is composed of the "phosphorescent organic compound" (column 9 line 59) that is created when the ligands of Figures 5a-5d are combined with the ligands of Figures 6a-6c and a "heavy transition metal such as Ir" (column 9, line 51). As can be seen from those figures, several of these materials (e.g., the one that results from combination of the leftmost ligand of the top row of Figure 5a or the right most ligand in the top row of Figure 5d with the ligands of Figure 6c and Ir, etc.) are cyclometalated organometallic compounds. Although the OLED as described in Lamansky et al. to as a "light emitting device" rather than one that specifically produces a photogenerated current when illuminated with light, the latter is an inherent property of the emissive layer formed as described in column 9 lines 54-61.

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As to claim 2, Lamansky et al. state in column 9, line 51 that their cyclometalated organic compound may contain a heavy transition metal such as Ir and list several other "preferred metals" for the invention including Pt in column 7 lines 46-52.

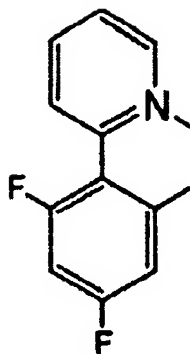
As to claim 4, the structure of this claim is obtained by combining the leftmost ligand of the top row of Figure 5a of Lamansky et al.:



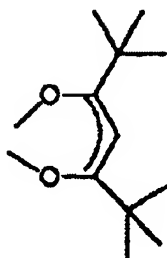
with any of the ligands in Figure 6c and using a transition metal such as Pt or Ir (column 7 lines 46-52), as instructed by Lamansky et al. in column 9 lines 54-61. This corresponds to the following values of the parameters listed in Formula (I) of claim 4: M is a transition metal having atomic weight greater than 40 (i.e., Pt or Ir); Z is C (as shown above); the dotted line of Formula (I) is a double bond (as shown above); R¹-R⁴ are independently selected from hydrogen, alkyl or aryl (as instructed in the caption of Figure 5a of Lamansky et al.); (X and Y) are ancillary ligands from Figure 6c (e.g., the leftmost ligands of the top two rows); a is one; b is one; and the sum of a and b is two.

As to claims 5-9 and 11, several of the cyclometalated organometallic compounds of Lamansky et al. formed as described in column 9, lines 54-62 have the structure recited in this claim. For example, the combination of the rightmost ligand in the top row of Figure 5d:

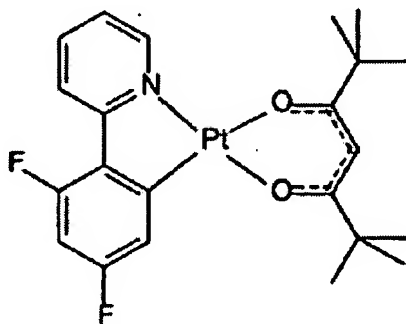
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with the leftmost ligand of the second row from top in Figure 6c:



and using a transition metal such as Pt(column 7 lines 46-52), as instructed by Lamansky et al. in column 9 lines 54-61. This creates the structure of the compound (4',6'-F₂PPY)Pt(dpm):

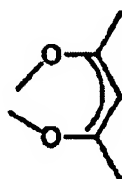


and corresponds to the following values of the parameters listed in the formula of claim 5: M is a transition metal having atomic weight greater than 40 (i.e., Pt); Z is C (as shown above); there are no R⁵ values (i.e., n = 0); there are two R⁶

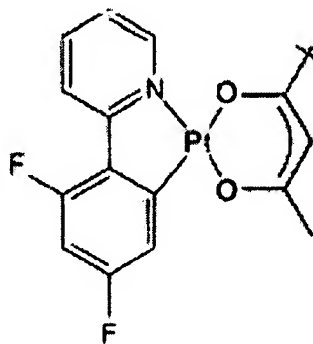
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values (i.e., $m = 2$, as shown above) and each is a halo group (i.e., fluorine); (X and Y) are the leftmost ancillary ligand from second to top two row of Figure 6c (as shown above); a is one; b is one; and the sum of a and b is two. It should be noted that this is one of many such example compounds created in the manner taught by Lamansky et al. that will read on claims 5-8. Note further, that the structure, formed as instructed by Lamansky et al., above is identical to the structure in the figure of claim 11 in the instant application.

Another example of a cyclometalated organometallic compounds of Lamansky et al. that reads on claims 5-9 is found by the combination of the rightmost ligand in the top row of Figure 5d (above) with the leftmost ligand of the top row of in Figure 6c:



and using a transition metal such as Pt(column 7 lines 46-52), as instructed by Lamansky et al. in column 9 lines 54-61. This creates the structure of the compound(4,6-F₂PPY)Pt(acac):



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and corresponds to the following values of the parameters listed in the formula of claim 5: M is a transition metal having atomic weight greater than 40 (i.e., Pt); Z is C (as shown above); there are no R^5 values (i.e., $n = 0$); there are two R^6 values (i.e., $m = 2$, as shown above) and each is a halo group (i.e., fluorine); (X and Y) are the leftmost ancillary ligand from the top row of Figure 6c (as shown above); a is one; b is one; and the sum of a and b is two. It should be noted that this is one of many such example compounds created in the manner taught by Lamansky et al. that will meet the structural limitations of claims 5-8. Note further, that the structure, formed as instructed by Lamansky et al., above is identical to the structure in the figure of claim 11 in the instant application.

As to claim 10, it is an inherent property of (4',6'-F₂ppy)Pt(dpm) (i.e., the cyclometallated organometallic compound from Lamansky et al. applied to claim 7 above) to form π -stacked chains. This is reflected in the specification of the instant application in Figure 6. See MPEP 2112 for a discussion of the inherency in regard to chemical structures and their properties.

As to claim 12, it is an inherent property of the cyclometallated organometallic material to absorb light in the near IR portion of the spectrum. For example, see Figure 5 of Lamansky et al. (US Patent 6,911,271) of (4,6-F₂PPY)Pt(acac) (the second compound discussed above in the context of claims 5-9).

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7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 1-3, 5-9 and 13-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Knowles et al. (US Patent Application Publication 2005/0164030).

As to claim 1, Knowles et al. disclose an organic photosensitive optoelectronic device (organic light emitting device, 100, Figure 1) comprising: an anode (anode, 115); an active region comprising a cyclometallated organometallic material (emissive layer, 135, the cyclometallated organometallic structure of which is shown in the formula of paragraph 0011); and a cathode (cathode, 160). Although the device in Figure 1 is referred to as a "light emitting device" rather than one that specifically produces a photogenerated current when illuminated with light, the latter is an inherent property of the emissive layer (135). This is confirmed by the statement made by Knowles et al. in paragraph 0070 that, not only may the "materials and structures" disclosed in this document be used "in devices other than OLEDs" (organic light emitting diodes), they may specifically be used in "organic solar cells" as well as "organic photodetectors."

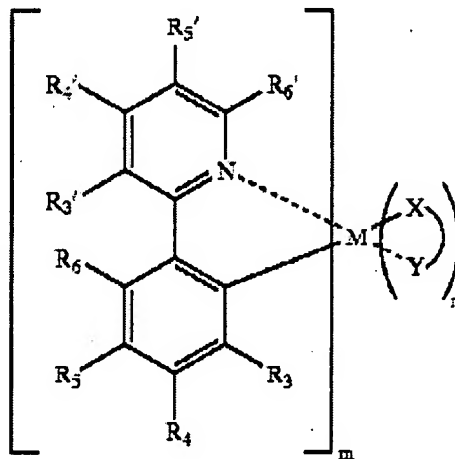
As to claim 2, Knowles et al. specifically state in paragraph 0098 that the cyclometallated organometallic material used as part of the active region (i.e., in

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layer 135) comprises a metal "having an atomic weight greater than 40." Further, they state more specifically in paragraph 0098, that both Ir and Pt are suitable.

As to claim 3, Knowles et al. explain in paragraph 0060 that the device of Figure 1 may comprises a blocking layer in order to reduce the number of charge carriers and/or excitons that leave the emissive layer.

As to claims 5-9, Knowles et al. disclose in the formula of paragraph 0103 that the emissive material of the emissive layer has the following structure:



which is identical to the structure in the figure of claim 5 in the instant application wherein: M is a transition metal having a an atomic weight greater than 40 (that M may be a transition metal is specified later in column 18 line 40 and that M has an atomic weight greater than 40 is given in paragraph 0098); ring A is an aromatic heterocyclic ring (see lower aromatic ring above formula) with at least one nitrogen atom that coordinates to the metal M (see above formula, in which the upper ring contains a nitrogen atom coordinated to M); Z is carbon; note that

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the way the group R_5 is described by Knowles et al. in paragraph 0014 (e.g., that they may be selected from aryls or heteroaryls, etc.) R_3 , R_4 and R_6 are described in Knowles et al. in paragraphs 0016, 0017 and 0019 (e.g., that they may be selected from the list of groups that include hydrogen, halogens, CN, alkyls, etc.) is completely compatible with the specifications of claim 5 for the corresponding groups R^5 ; note that the way the group R'_3 is described in Knowles et al. in paragraph 0013 (e.g., that it may be selected from the list of groups that include alkyls, heteroalkyls, aryls heteroaryls, etc.) and the way in which R'_4 - R'_6 (i.e., each R') is described by Knowles et al. in paragraph 0023 (e.g., that they may be independently selected from H, alkyl, etc.) is completely compatible with the specifications of claim 5 for the corresponding groups R^6 ; (X and Y), separately or in combination, are an ancillary ligand (paragraph 0024); n is 1 to 4 (in Knowles et al., as stated above, n may be any value from 1, the case in which three groups R_3 , R_4 and R_6 are hydrogen, to 4, the case in which none of the groups R_3 - R_6 is hydrogen); m is 0 to 4 (in Knowles et al., as stated above, m may be any value from 1, the case in which all groups R'_4 - R'_6 are hydrogen, to 4, the case in which none of the groups R'_3 - R'_6 is hydrogen). Further, Knowles et al. state the range for values of a and b ("m" and "n", respectively, in the formula of paragraph 0011) in paragraphs 0025 and 0026, that a is at least 1 (0025) and that b is at least zero. While this range fully encompasses that given in claims 5 and 6 (i.e., that a varies from 1-3, b from 0-2 and that: $a+b=2$ or 3) and that given in claims 7 and 8 (i.e., that: $a=b=1$), Thompson et al. fail to disclose the values given in these claims explicitly.

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Nevertheless, one of ordinary skill in the art at the time of the invention would have optimized both these variables. Since these adjustable parameters (i.e., m and n in the above figure) are recognized as result-effective variables, i.e., variables that achieve recognized results, the determination of the optimum or workable ranges of said variable can be characterized as routine experimentation. See also *In re Boesch* (617 F.2d 272 USPQ 215 CCPA 1980). This includes both adjusting a and b so that their sum is 2 or 3 (as in claims 5 and 6) and such that they are both equal to one (as in claims 7 and 8).

As to claim 13, Knowles et al. specifically disclose in paragraph 0070 that the structures and layers in their organic photosensitive device may be used in an "organic solar cell" which is a type of photovoltaic device.

As to claims 14 and 15, Knowles et al. specifically disclose in paragraph 0070 that the structures and layers in their organic photosensitive device may be used in an "organic photodetector." Since photodetectors are based on the use of photoconductive materials to detect light, when Thompson et al. disclose the use of the device as a photodetector they implicitly disclose that it contains photoconductive material.

9. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Knowles et al. (US Patent Application Publication 2005/0164030) as applied to claim 1 and further in view of Okada et al. (US Patent 7,189,917).

Knowles et al. disclose all of the features of claim 1 and further disclose in paragraph 0070 that their device may be used in an "organic solar cell" or

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photovoltaic element, but fail to disclose that the device may contain multiple subcells in series.

Okada et al. show a stacked photovoltaic element (stacked photovoltaic device, 300, depicted in Figure 1) comprising a plurality of unit photovoltaic elements (first photovoltaic device, 305, second photovoltaic device, 303) each composed of a pin-junction (Okada et al. explain that 305 may be a "pin junction" in line 13 of column 6 and that 303 may be a "pin junction" in line 22 of column 5), connected to each other in series (as shown in Figure 1). As Okada et al. explain in column 1 lines 20-22, the use of a stacked photovoltaic device with multiple subcells connected in series allows the device to absorb a wider wavelength region of light. It would have been obvious to one of ordinary skill in the art at the time of the invention to use the stacked configuration of Okada et al. with the organic solar cell layers of Knowles et al. as multiple subcells in order to absorb a wider wavelength region of light.

10. Claims 1-3, 5-9 and 13-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Thomson et al. (US Patent 7,011,897 B2).

The applied reference has two common inventors with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 102(e) might be overcome either by a showing under 37 CFR 1.132 that any invention disclosed but not claimed in the reference was derived from the inventor of this application and is thus not the invention "by another," or by an appropriate showing under 37 CFR 1.131.

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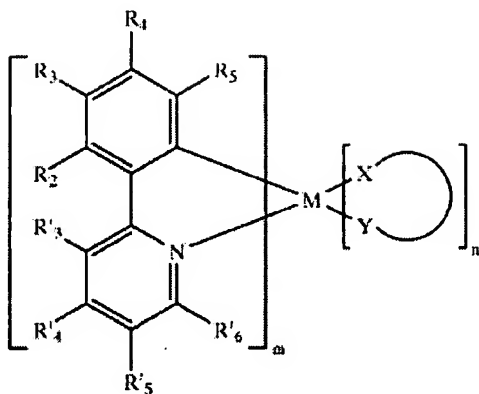
As to claim 1, Thompson et al. disclose an organic photosensitive optoelectronic device (organic light emitting device, 100, Figure 1) comprising: an anode (anode, 115); an active region comprising a cyclometallated organometallic material (emissive layer, 135, the cyclometallated organometallic structure of which is shown in the Formula 9, in column 18, lines 6-20); and a cathode (cathode, 160). Although the device in Figure 1 is referred to as a "light emitting device" rather than one that specifically produces a photogenerated current when illuminated with light, the latter is an inherent property of the emissive layer (135). This is confirmed by the statement made by Thompson et al. in column 12, lines 19-24 that, not only may the "materials and structures" disclosed in this document be used "in devices other than OLEDs" (organic light emitting diodes), they may specifically be used in "organic solar cells" (column 12, line 21).

As to claim 2, Thompson et al. specifically state in column 18, lines 22-23 that the cyclometallated organometallic material used as part of the active region (i.e., in layer 135) comprises a metal "having an atomic weight greater than 40." Further, they state more specifically in Column 18, line 43, that both Ir and Pt are suitable.

As to claim 3, Thompson et al. explain in column 8, lines 41-45 that the device of Figure 1 may comprises a blocking layer in order to reduce the number of charge carriers and/or excitons that leave the emissive layer.

As to claims 5-9, Thompson et al. disclose in Formula 9 (column 18) that the emissive material of the emissive layer has the following structure:

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which is identical to the structure in the figure of claim 5 in the instant application wherein: M is a transition metal having a an atomic weight greater than 40 (that M may be a transition metal is specified later in column 18 line 40 and that M has an atomic weight greater than 40 is given in column 18, lines 22-23); ring A is an aromatic heterocyclic ring (see lower aromatic ring of Formula 9 in above re-print) with at least one nitrogen atom that coordinates to the metal M (see Formula 9 or re-print above, in which the lower ring contains a nitrogen atom coordinated to M); Z is carbon; note that the way the groups R_2 - R_5 are described in Thompson et al. in column 18, lines 24-35 (e.g., that they may be "independently selected" from the list of groups that include hydrogen, halogens, CN, alkyls, but that at least one of R_3 or R_5 is "either an electron withdrawing group or an electron donating group", etc.) is completely compatible with the specifications of claim 5 for the corresponding groups R^5 ; note that the way the groups R'_2 - R'_5 are described in Thompson et al. in column 18, lines 24-35 (e.g., that they may be "independently selected" from the list of groups that include H, halogens, CN, alkyls, etc.) is completely compatible with the specifications of

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claim 5 for the corresponding groups R^6 ; (X and Y), separately or in combination, are an ancillary ligand (column 18, line 38); n is 1 to 4 (in Thompson et al., as stated above, n may be any value from 1, the case in which three groups R_2 - R_5 are hydrogen, to 4, the case in which none of the groups R_2 - R_5 is hydrogen); m is 0 to 4 (in Thompson et al., as stated above, m may be any value from 0, the case in which all groups R'_2 - R'_5 are hydrogen, to 4, the case in which none of the groups R'_2 - R'_5 is hydrogen). Further, Thompson et al. state the range for values of a and b ("m" and "n", respectively, in Formula 9) column 18 lines 46-47, that a is at least 1 and that b is at least zero. While this range fully encompasses that given in claims 5 and 6 (i.e., that a varies from 1-3, b from 0-2 and that: $a+b=2$ or 3) and that given in claims 7 and 8 (i.e., that: $a=b=1$), Thompson et al. fail to disclose the values given in these claims explicitly.

Nevertheless, one of ordinary skill in the art at the time of the invention would have optimized both these variables for any application. Since these adjustable parameters (i.e., m and n in the above figure) are recognized as result-effective variables, i.e., variables that achieve recognized results, the determination of the optimum or workable ranges of said variable can be characterized as routine experimentation. See also *In re Boesch* (617 F.2d 272 USPQ 215 CCPA 1980). This includes both adjusting a and b so that their sum is 2 or 3 (as in claims 5 and 6) and such that they are both equal to one (as in claims 7 and 8).

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As to claim 13, Thompson et al. specifically disclose in column 12, line 21 that the structures and layers in their organic photosensitive device may be used in an "organic solar cell" which is a type of photovoltaic device.

As to claims 14 and 15, Thompson et al. specifically disclose in column 12, line 22 that the structures and layers in their organic photosensitive device may be used in an "organic photodetector." Since photodetectors are based on the use of photoconductive materials to detect light, when Thompson et al. disclose the use of the device as a photodetector they implicitly disclose that it contains photoconductive material.

11. Claim 16 is rejected under 35 U.S.C. 103(a) as being anticipated by Thomson et al. (US Patent 7,011,897 B2) in view of Okada et al. (US Patent 7,189,917).

Thompson et al. disclose all of the features of claim 1 and further disclose in column 12, line 21 that their device may be used in an "organic solar cell" or photovoltaic element, but fail to disclose that the device may contain multiple subcells in series.

Okada et al. show a stacked photovoltaic element (stacked photovoltaic device, 300, depicted in Figure 1) comprising a plurality of unit photovoltaic elements (first photovoltaic device, 305, second photovoltaic device, 303) each composed of a pin-junction (Okada et al. explain that 305 may be a "pin junction" in line 13 of column 6 and that 303 may be a "pin junction" in line 22 of column 5), connected to each other in series (as shown in Figure 1). As Okada et al. explain in column 1 lines 20-22, the use of a stacked photovoltaic device with

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multiple subcells connected in series allows the device to absorb a wider wavelength region of light. It would have been obvious to one of ordinary skill in the art at the time of the invention to use the stacked configuration of Okada et al. with the organic solar cell layers of Thompson as multiple subcells in order to absorb a wider wavelength region of light.

Conclusion

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jack Smith whose telephone number is (571) 272-9814. The examiner can normally be reached on 7:30 a.m. - 5:00 p.m., Mon - Fri.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Alexa Neckel can be reached on (571) 272-1446. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service

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Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JRS

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